

# Accident Investigation Reports Public Meeting August 31, 2004



*Sponsored by:*

*U.S. Department of Energy, Oak Ridge Operations  
Oak Ridge Site Specific Advisory Board*

# Welcome and Introductions

- Walter Perry, Moderator
- Kerry Trammell, Chairman  
Oak Ridge Site Specific Advisory Board
- Gerald Boyd, Manager  
DOE Oak Ridge Operations

# Improving Safety and Emergency Management

- **Strengthening Accountability for Safety and Emergency Management**
  - Federal Organization Accountability
  - Contractor Accountability
  - Tenant Accountability
- **Improving Transportation Safety**
  - Reviewing Transportation Readiness (Transportation Assessment Team)
  - Reducing Shipments on Public Roads (On-Site Haul Roads)

**Sodium Release at the  
East Tennessee Technology Park**  
*Accident Investigation Reports Public Meeting  
August 31, 2004*

*Larry W. Clark, Executive Director  
Office of Assets Utilization  
DOE Oak Ridge Operations*

# Background on the Sodium Release at the East Tennessee Technology Park

- The May 8, 2004 sodium release occurred at the East Tennessee Technology Park (ETTP) on DOE property leased to the Community Reuse Organization of East Tennessee (CROET) and subleased to Toxco Inc.



**Former Powerhouse Area at ETTP**

# Background on Sodium Release, (Cont'd)

- Under a contract with DOE, Toxco had obtained title to approximately 110,000 pounds of sodium components for recycling as an alternative to disposal by Environmental Management (EM).
- The sodium was contained in aluminum clad components with the largest resting in concrete saddles.



**Sodium Component at Tower Shielding Facility Prior to Relocation**

# Background on Sodium Release, (Cont'd)

- Toxco teamed with Commodore Advanced Sciences Inc. to remove the sodium from several large components (11 feet in diameter) on its leased property.
- The first component was placed in a containment structure or “Hot Box” designed to heat the sodium to a liquid state so that it could be transferred to a suitable DOT-approved shipping container.



**Sodium-filled Component and Lower Half of the Containment Structure or “Hot Box”**

# Background on Sodium Release, (Cont'd)

- On the morning of May 8, Commodore workers were heating the first component inside the containment structure when a rupture of the aluminum casing occurred, releasing an estimated 400 pounds of molten sodium onto the floor of the containment structure.
- A seal then failed on the containment door allowing a portion of the sodium to be released to the environment, initiating an exothermic reaction with moisture in the air and soil.



**The Point Where the Sodium Emerged  
From the Component Into the  
Containment Structure**

# Background on Sodium Release, (Cont'd)

- Workers attempted to stem the flow by using Class D Met-LX Fire Extinguishers, the approved extinguisher for sodium fires, but this did not halt the release.
- With the sodium's exposure to the air and standing water on the surface of the ground, reaction products of sodium hydroxide, sodium peroxide, and sodium dioxide began to form and drift away from the immediate area.



**Aftermath of Sodium Release  
Showing Reaction Products on the  
Sill of Hot Box**

# Background on Sodium Release, (Cont'd)

- These hazardous reaction products are severe irritants and effects of inhaling or swallowing them can range from mild irritation to serious damage of the upper respiratory tract, mouth, throat or stomach, depending on the severity of the exposure.
- This plume of hazardous residues and inability to predict when the reaction would subside led to the Tennessee Emergency Management Agency's recommendation for a temporary closure of the Clinch River and Highway 58, and evacuation of residents within a half-mile radius.



**Aerial Photo of Site Taken in Early Afternoon on the Day of the Release**

# Background on Sodium Release, (Cont'd)

- Since the heaters had been shut off and the plume was diminishing, the reaction was allowed to continue as the most prudent course of action. The reaction subsided and totally ceased approximately 15 hours after initiation.
- Field monitoring teams detected no air concentrations or surface depositions offsite, hence there were no offsite environmental effects or population exposures.



**Commodore Workers Preparing for Recovery Operations**

# Recovery Activities to Date

- Recovery activities were initiated the following day, May 9.
- The top half of the “Hot Box” has been removed, the failed component has been removed from the “Hot Box,” and the reacted Sodium is being removed from the floor and containerized.



**Reacted Sodium on Floor of the Hot Box Prior to Removal**

# Recovery Activities to Date, (Cont'd)

- After removal of the failed sodium component from the “Hot Box” structure, both it and the “Hot Box” were relocated to an adjacent Toxco building where they are now.
- It has not yet been decided what will be done with the remaining sodium components. The primary focus has been on the immediately necessary steps of recovery and stabilization.



**Failed Component and Lower Half of  
Hot Box in Toxco Facility**

# Investigation of the Event

- On May 10, 2004, the Manager of Oak Ridge Operations charged a local team with assessing safety requirements and improvement measures needed in the oversight of lessee activities, and appointed a second team to plan recovery activities.
- The Manager further appointed an independent Type B Accident Investigation Team on May 17, 2004.
- The Type B Team gathered relevant documents, collected evidence, conducted interviews, and performed causal factors analysis and barrier analysis, and issued their final report on August 17. The final report is available in the DOE Information Center.

# Type B Investigation Board Conclusions

- The Board concluded that the direct cause of the incident was:
  - The sodium component failed due to over pressurization, and
  - The secondary containment (“Hot Box”) failed to contain the resultant sodium release allowing the sodium to come in contact with the environment
- The Board concluded there were inadequacies in DOE line management in the following areas:
  - Lack of Clarity in Roles, Responsibilities, and Authorities of Participants
  - Insufficient Safety and Health Oversight of the Sublessee’s Operations
  - Failure to follow the intent of the Secretary’s Moratorium on Recycling Metals

# Type B Investigation Judgments of Need

- Corresponding to the conclusions, the Report lists 15 Judgments of Need which fall primarily into the areas of:
  - Improved Lease and Contract Controls
  - Better Definition of Roles, Responsibilities, and Authorities
  - More Rigorous Health and Safety Flowdown and Oversight
  - Better Defined Emergency Response Protocols
  - A More Formal Process for Ensuring Secretarial Policies are Followed
- The full text of these Judgments of Need is contained in Table ES-1, on page *vii* of the Type B Investigation Report.

# Corrective Actions

- Corrective Actions Are Proposed or Already Underway in the Following Areas:
  - Health and Safety Plans
  - Clarification of Roles, Responsibilities, and Authorities
  - Participation of DOE Facility Representatives
  - Controls in Contracts
  - Added Lease Clauses
  - Emergency Action Levels (EALs)
- A formal Corrective Action Plan is being developed to outline detailed implementation of all the above actions.

# **Strontium-90 Incident**

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*Stephen McCracken, Assistant Manager  
Office of Environmental Management  
DOE Oak Ridge Operations*

# Facility Background

- Operations were initiated in 1982 to process liquid low level waste (LLLW) for injection into deep shale fractures
- From 1982-1984, a total of 2.9 million gallons of cement was injected – total activity in the cement was approximately 750,700 Curies (Ci) of Strontium-90, Cesium-137, Curium-244 and other transuranics and nuclides
- Facility was placed in surveillance and maintenance mode in 1984
- RCRA closure occurred in 1996
- Subcontract for D&D awarded to Safety and Ecology Corporation (SEC) in April 2001
- Demolition initiated April 2003



**New Hydrofracture Facility (NHF) Prior to D&D Activities, Looking North**

# New Hydrofracture Facility Floor Plan





**Demolishing Control Room and Support Areas**



**Removing Upper Portion of Penthouse**



**Demolishing Pump Rooms A&B**

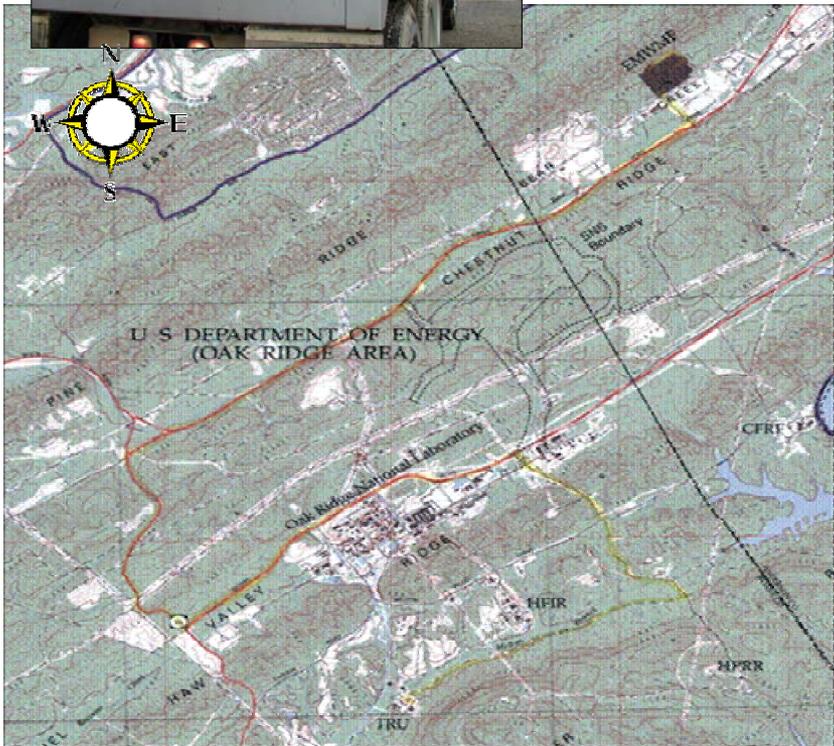


**Removing Tank T-12 from T13 Enclosure**

# May 14 Event Description



**T-12  
Shipment**



**Shipment Route**

- Truck left NHF at 11 a.m. and arrived at Onsite Disposal Facility at 11:30 a.m.
- Arrival survey detected contamination and Onsite Disposal Facility road shut down at 11:45 a.m.
- Notification to DOE-ORO personnel by 12:15 p.m.
- Contamination detected on Melton Valley Access Road at 1:20 p.m.
- TEMA closed portions of Highway 95 for radiological survey at 4:21 p.m.
- Radiological surveys initiated at 5:45 p.m.
- Bear Creek Road between ORO check point 20 and Highway 95 closed at 6:22 p.m.
- Work at NHF suspended

# Subsequent Actions (May 14-21)

- Radiological Surveys
- Areas of Contamination Removed
- Private Vehicles Surveyed
- Short-Haul Work Suspended
- ORO Manager Initiated Type B Investigation



# Pre-Cursor Events

- **March 16** – 12 to 18 inches of liquid discovered in the tank
- **April 14** – Portland cement added to solidify liquid
- **April 20 – May 12** – Tank T-12 was stored for several weeks in adjacent facility without adequate weather protection
- **May 12** – Liquid discovered in tank wrapping while loading for transport
- **May 13** – Truck bed tilted in an effort to collect and remove any additional liquid
- **May 14** – Visual inspection performed and truck was cleared to go



**Tank T-12  
Being Placed  
Into a Truck  
Bed Lined With  
Plastic**



**Tilting the Truck Bed to  
Collect Any Additional Liquid**

# Type B Investigation

- The Manager of Oak Ridge Operations appointed a Type B Investigation Team on May 21, 2004.
- The Final Report “*Subcontractor Radioactive Release During the May 14, 2004, Transportation Activities, Bechtel Jacobs Company, LLC, Oak Ridge, Tennessee*” was released on August 17, 2004 and made available in the DOE Information Center.
- The report lists seven Judgments of Need with two root causes and five contributing causes for the event.
- Bechtel Jacobs Company and DOE-EM directed to provide a Corrective Action Plan by September 16, 2004.

# Type B Investigation Results

- The Investigation Team Concluded That:
  - SEC's Work Control Process was not adequate to properly prepare Tank T-12 for safe transportation
  - SEC did not accurately characterize Tank T-12 for transportation
  - Neither BJC's or ORO-EM's oversight was adequate to ensure SEC's Work Control Processes were adequate or that Tank T-12 was properly characterized for transportation
  - Neither SEC's Quality Assurance Process nor BJC's or SEC's Corporate Lessons-Learned Program was adequately utilized
- The Investigation Team Determined Two Root Causes:
  - SEC had Inadequate Work Control Processes
  - SEC Performed Inadequate Characterization of Tank T-12 for Transportation

# Draft Corrective Actions

- Based on the Judgments of Need from the Type B Investigation Report
  - **SEC:** Improve and Follow Work Control Plans; Accurately Characterize (Including Changed Conditions); and Improve Quality Processes (Communication, Feedback, Implementation)
  - **BJC:** Improve Oversight and Communication
  - **BJC and SEC:** Improve Application of Lessons-Learned
  - **ORO:** Improve Emergency Response to Ensure Central Command and Control
  - **ORO-EM:** Improve Oversight, Communication, and Identification of High Risk Activities

# Future Actions

- Formal Corrective Action Plan
- Complete the Balance of NHF D&D Work
- Dedicated Haul Roads

# Summary Comments

- Gerald Boyd, Manager  
DOE Oak Ridge Operations

# Question and Answer Session

- Walter Perry, Moderator